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IIW Commission V

**Quality Control and Quality Assurance
of Welded Products**

Annual Report 1998/99

Thomas A. Siewert

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IIW Commission V

Quality Control and Quality Assurance of Welded Products

Annual Report 1998/99

Thomas A. Siewert

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IIW Document V-1123-99

January 1999



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TECHNOLOGY ADMINISTRATION, Gary R. Bachula, Acting Under Secretary for Technology
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY, Raymond G. Kammer, Director

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This Annual Report 1998/99 for Commission V, Quality Control and Quality Assurance of Welded Products, of the International Institute of Welding includes (a) minutes, resolutions, and the future program adopted at its Annual Assembly in September 1998, (b) the organization, officials, and delegates, (c) schedules of meetings, and (d) the status of documents published by Commission V. It reviews current research and work on standardization.

Key words: eddy-current inspection; nondestructive evaluation; quality assurance; ultrasonic inspection; welding; x-ray inspection

1. Introduction

Commission V, Quality Control and Quality Assurance of Welded Products, covers issues of weld inspection and quality control for the International Institute of Welding (IIW) and meets annually to review the past year's accomplishments and to discuss future activities. In September 1998, the Annual Assembly was held in Hamburg, Germany, to review commission activities and accomplishments during the past year and to discuss future endeavors. This report summarizes the information presented at the 1998 Annual Assembly: descriptions of both research and draft ISO standards being developed from the research data. The information comes from the various multinational subcommissions, working groups, and task groups within Commission V. Thus, this summary provides an up-to-date review of research activities in other countries and advance notice of standardization activities.

Commission V includes subcommissions that concentrate on quality assurance in welding technology and the principal techniques for nondestructive inspection (x-ray, ultrasonic, electrical, magnetic, and optical) and a working group whose task is inspection of offshore construction. This year, Commission V met September 14 through 16 in Hamburg. Twenty-two delegates and experts from fourteen countries attended the meetings.

The organization, officials, and delegates of Commission V are outlined in Appendix A, along with the subcommittee and working group meetings held during the past year. Recent and current documents are listed in Appendix B.

Neither endorsement nor criticism of tradenames mentioned in or omitted by this report is implied or intended. Tradenames, when given, are present only for scientifically complete description of apparatus used to produce standard reference radiographs.

The scope of Commission V includes the various issues associated with the inspection and quality control of welds. Currently, Commission V is concentrating on the following areas:

- validation of nondestructive testing (NDT) techniques,
- NDT to assess fitness for purpose,
- NDT acceptance criteria for weld-quality classes,
- quality assurance in welding technology,
- radioscopic systems (including preparation of ISO standard proposals),
- radiographic imaging,
- classification of radiographic film systems (including preparation of ISO standard proposals),
- ultrasonic imaging and automated ultrasonic testing,
- revision of the manual for ultrasonic examination of ferritic welds,
- investigation of the use of low-frequency eddy currents for examining the surfaces of ferritic welds and austenitic material and the structure of Al welds,
- use of liquid penetrants to inspect welds,
- inspection of offshore welded constructions,
- review of the requirements of ISO 5817,
- digitization of radiographic film.

National delegates to Commission V are listed in Appendix A.5.

2. Minutes of the Annual Assembly 1998

This section summarizes the information presented at the Annual Assembly in 1998, and includes descriptions of both research and draft ISO standards being developed from the research data. The information comes from the various multinational subcommissions, working groups, and task groups within Commission V. Thus, the following summary provides an up-to-date review of research activities in the countries represented and advance notice of standardization activities. The following summary is based on notes taken during the meetings and on IIW documents V-1118-98, V-1121-98, and V-1122-98 (daily minutes of the Annual Assembly).

2.1 Subcommission VA – Radiography-Based Weld Inspection Topics

The Subcommission Chairman, H. Heidt, was unable to attend, so the Vice Chairman, U. Ewert, led the meeting. He introduced U. Zscherpel, who described the procedures used to digitize the radiographs that are used in our latest film catalog; these procedures allow the original radiographs to be copied with the highest quality. He described how the task group evaluated various scanners, until they found one with both a contrast sensitivity at least as good as that of a human eye and a pixel size of 40 micrometers (for good resolution). This system also allowed programming of the optical density curve to convert films to the optimum range for optical viewing. After scanning, the useful range of the image data was scaled to the full range of the human eye. They found that a printer was needed with a density range different from those of typical medical systems. In all, an unusual combination of equipment was required to develop the desired range of properties for the final images. We thanked the researchers at BAM for solving these problems so the radiographic catalogs could now be sold. I read a letter from the task group responsible for overview of this project that agreed that the new procedures were fully acceptable. The Commission members unanimously passed

resolution 1, "The latest digital copying technique developed by BAM was found to produce fully acceptable images (compared to the original film radiographs). Therefore, these images are released for sale by IIW, as Reference Radiograph Set V-1056-95."

Next, Dr. Ewert presented a short summary of the status of the Subcommission activities (IIW Document V-1103-98) over the past year. He summarized some details of the film system gradient described in ISO 11699 parts 1 and 2. Unfortunately, the ISO film classes are not the same as those used in Germany or in the U.S. BAM has compared different brands of film and found that most had the same film gradient, but different granularities. BAM has started a round robin among film manufacturers to resolve this problem. They are also studying whether films and chemical processing solutions can be mixed and matched between manufacturers.

For the working party on Radioscopic Systems for Weld Inspection, Dr. Ewert reported that a new standard prEN13068/1-3 is being finalized within CEN. Part 1 covers quantitative measurement of imaging properties, part 2 covers qualitative control and long-term stability of imaging devices, and part 3 covers the general principles of radioscopic inspection of construction materials by x- and gamma-rays. Part 3 has three system classes that cover the ranges of 0.4 to 0.6 mm of inherent detector unsharpness, 5 to 20% distortion, and homogeneity of 10 to 30%. The standard also includes tables for system performance in terms of both single and double-wire image quality indicators for various contrast sensitivities.

U. Zscherpel summarized the CEN activity on standardization of film digitization equipment. The CEN group began by collecting information from various sources. They obtained information from ASTM E7.02, and they obtained from the Electric Power Research Institute (EPRI) a standard reference film for evaluating the resolution of digitizers. They have evaluated this film and found it to be quite useful in assessing the performance of film digitizers. CEN TC 138 WG 1 has recently developed a draft of a new standard on quantitative measurement of image quality parameters based on the EPRI standard. This means that both the U.S. and Europe can use the same film standard. More details can be found at <http://trappist/CEN-NFD/cenahg3.html>. We passed Resolution 2, "Subcommission VA is forming a new working party, Standardization of NDE Film Digitization, and invites interested parties to contact U. Zscherpel at BAM," to publicize this new working group.

U. Ewert also announced his intention to add the study of new detection equipment to the working program for Subcommission VA. In particular, he proposes to evaluate digital radiography by imaging plates and by new flat detectors.

Finally, he mentioned that the International Atomic Energy Association has received a consultant report on digital radioscopy in industrial applications. The IAEA report proposes:

- to develop a database on radioscopic education and training in developing countries,
- to hold a workshop on standardization of industrial digital radiography,
- to coordinate research on this topic (including an international comparison of radioscopic techniques under consideration by CEN), and
- to define a low-cost radiographic system.

At the next meeting, we expect to learn the response of the IAEA to this report.

We passed Resolution 3: "Commission V forwards Document V-1111-98, Application of Imaging Plates in the Radiographic Examination of Welding Joints, for publication in Welding in the World."

We confirmed our plan to hold the next intermediate meeting from 08:30 to 16:00 on the day after our harmonization workshop in March 1999 in Orlando.

2.2 Subcommittee VC – Ultrasonically Based Weld Inspection Topics

The Chairman of Subcommittee VC, H. Wüstenberg, gave a short summary of his report of the activities during the past year based on both his annual report (IIW Document V-1104-98) and the minutes of the intermediate meeting (IIW Document V-1117-98).

The intermediate meeting of the Subcommittee was held at the Institut de Soudure in Paris, France on January 20, 1998.

Highlights from the report included the news that:

- the working group on ultrasonic inspection of stainless steel weldments plans to complete their revision of the handbook on ultrasonic inspection of stainless steel welds in the first half of 1999. A major reason for the revision is to include newer inspection techniques.
- on the topic of validation of ultrasonic techniques for weld inspection, we learned that a recent report from the European Network for Inspection Qualification (ENIQ) is being circulated within the subcommittee and that the subcommittee has been briefed about the activities of the European Pressurized Equipment Research Council,
- the characterization of IIW ultrasonic calibration blocks and the study of the variations continues at BAM and NIST (summary in document V-1116-98), and
- the working group on automation and imaging for ultrasonic weld inspection is following the progress of the document on ultrasonic testing systems for automatic inspection. The latest draft is dated August 1998 and is being prepared by the German Society for NDT. When the German document is finished, the IIW group will gather documents from other countries and try to develop a consensus document.

Wüstenberg offered some comments on the time-of-flight-diffraction (TOFD) technique for ultrasonic inspection. A critical assessment of this technique has shown some cases where interpretation is quite difficult. For example, it can be difficult to discriminate the upper and lower crack tips, especially for small lack of fusion defects in welds where the signals from the two edges overlap. Also surface-breaking cracks are difficult to measure. This can be very important in thin plates, where a lower limit of detection of 3 mm can be a large fraction of the plate thickness. The audience pointed out that some systems combine the pulse echo technique with TOFD to give a greater assurance of detecting cracks in these special circumstances. Wüstenberg indicated that further studies are underway.

To generate a better understanding of some of the details of automated inspection, we passed the following Resolution (4):

Commission V invites interested persons to a microseminar, "Manual Versus Automated Inspection: Human Factor Influences and Cost Effectiveness," to be held during the 1999 Assembly.

This microseminar will include contributions for all the various techniques, but will be led by Prof. Wüstenberg.

The future work program of subcommission VC includes:

- revision of the Handbook on the Examination of Austenitic Welds,
- elaboration of statements concerning special questions on TOFD and inspection of spot welds,
- revision of the IIW document concerning ultrasonic inspection, especially for the IIW calibration block,
- validation of ultrasonic techniques for weld inspection,
- review of automatic ultrasonic inspection methods (including phased array), and revision of the manual on this topic, and
- acceptance criteria for the ultrasonic inspection of welds.

The next meeting of the subcommission is proposed for Thursday March 25, 1998 in Orlando, in conjunction with the spring ASNT meeting. Our meeting will require about four hours, perhaps 08:30 to 12:30. We assigned numbers to documents to be presented at that meeting and to be distributed for next year's Annual Assembly. These were V-1119-98, "Critical Assessments of the TOFD Approach for Ultrasonic Weld Inspection," by A. Erhard, E. Schulz, G. Brekow, H. Wüstenberg, and P. Kreier, and V-1120-98, "Characterization of UT Probes and Equipment in View of Phased Array Technology," by H. Wüstenberg.

2.3 Subcommission VE – Weld Inspection Topics Based on Electrical, Magnetic, and Optical Methods

G. Dobmann, the Chairman of Subcommission VE, reviewed recent activities (IIW Document V-1106-98).

The subcommittee held one intermediate meeting on January 21, 1998 at the Institut de Soudure in Paris. Dr. Dobmann reviewed the activities of the meeting. At that meeting, we discussed final revisions to A. Doubov's report on the magnetic memory technique, which has now been published in *Welding in the World*. Also at that meeting, the working party on characterization of black light lamps (chaired by R. Marmigi of Italy) delivered draft versions of documents on the use of liquid penetrants at elevated temperatures.

Dr. Peri was present at this meeting and presented the final versions of the two contributions from the Italian Delegation: V-1112-98, "Non-Destructive Testing—Characterization of Penetrants for Hot Surfaces in Weld Inspection," a draft for consideration by ISO, and V-1113-98, "Penetrants for Hot Surfaces in Welding Inspection: Experimental Work and First Results," the technical supporting documentation. We passed two resolutions:

- Resolution 5: Commission V forwards Document V-1112-98, "Non-Destructive Testing—Characterization of Penetrants for Hot Surfaces in Weld Inspection," to ISO through Route 1. (Delegate Votes: 6 for, 0 against or abstain.)

- Resolution 6: Commission V forwards Document V-1113-98, "Penetrants for Hot Surfaces in Welding Inspection: Experimental Work and First Results," for publication in *Welding in the World*.

Francesco Peri has also chaired the working party on characterization of nonmetallic welds. Several years ago, Dr. Peri prepared and circulated a questionnaire on experimental research and standardization activities, but received replies from only two countries. The scope of the questionnaire was broadened to include thermal-barrier coatings and corrosion-protection coatings. The questionnaire was distributed again to the Delegates but only one reply expressed interest. Meanwhile, a presentation at the intermediate meeting by the Russian delegation indicates that they are a major source of information on this topic.

Dr. Dobmann summarized the magnetic memory technique, as described in Document V-1096-97, and described a proposal to compare the information from this technique with that obtained from other techniques for measuring stress and strain. Many of the other techniques (x-ray diffraction, ultrasound, and hole-drilling techniques) have limits to their range of applicability. Such a comparison would provide quantitative data on the capabilities of the various techniques.

To announce the status and to promote these two activities, we passed the following two resolutions:

- Resolution 8: Subcommission VE announces a new working party, "Round Robin to Compare Magnetic Memory to Other Stress Measurement Techniques." Interested persons should contact G. Dobmann at IZFP.
- Resolution 9: Subcommission VE announces a new working party, "Control of Welds in Polyethylene Using NDE Techniques," which will be chaired by N. Khimchenko of the Russian Delegation.

The future working program includes:

- low-frequency eddy-current inspection for replacement of magnetic particle inspection of ferritic weldments,
- eddy-current and other electromagnetic inspection of bonded airplane structures, especially for "hidden corrosion,"
- hot inspection of welds by liquid penetrants,
- new activities on thermographic inspection of welds,
- questionnaire on nonmagnetic weldments, and
- organization of a European Project on residual-stress measurements (including Russia, Bulgaria, Romania, Poland, and Western European Countries).

The intermediate meeting will be held in Orlando after the harmonization workshop. It will require about four hours (perhaps 14:00 to 18:00) and could follow the meeting of Subcommission VC.

2.4 Subcommittee VB – Quality Management in Welding Technology

We had no annual report because of the vacancy in this Chairmanship. Therefore, our most important task at this meeting was to elect a new chairman who could drive and direct our activities in this area. We had announced this opportunity during the first two days of the meeting (to give potential candidates a chance to gather support), and held an election on the third day of our meetings. To announce the results, we passed the following resolution: "Commission V has elected C. Pepper of the U.S. delegation as the Chairman of Subcommittee VB."

Next, we discussed how to strengthen some of the topics, such as real-time monitoring and a revision of ISO 9000 that is now in the DIS status. Also, we discussed how to overcome the barriers due to the different approaches that now exist in various countries, and how to construct components with a wide range of quality, including lower quality, which meets the internal needs of developing countries.

For now, the working program remains the same:

- formulating a concept for quality management in welding (to clarify the relationship between existing standards and investigate the need for new standards),
- formulating a guideline for quality management in welding (to help the user to select a quality management system adequate for their organization), and
- collecting information on computer-aided quality control, on-line weld monitoring, fitness for purpose, and acceptance criteria in welding (to define the need for further support in applying these tools).

2.5 Subcommittee VF – Weld Defects and Their Significance

We discussed the reactivation of this subcommittee, which has been inactive for several years. Although we have not identified a candidate for chairman, we found a number of topics which might be considered by this subcommittee. For example, advances in statistical techniques allow greater assurance of proper inspection. Meanwhile, we asked Olaf Førli to meet with Steve Maddox to consider organizing a microseminar on the significance of weld defects and how they interact with fatigue and fracture calculations. (Late in the week we learned that Commission XIII proposes a joint workshop for 1999 with Commission V on the topic of the capabilities and deficiencies of NDT methods for detecting and sizing flaws that can influence fatigue life.)

Olaf Førli gave a presentation on Document V-1115-98 "Guidelines for NDE Reliability Determination and Description." Some of the lessons that they have learned through their studies are: NDE reliability studies are very expensive, NDE is less reliable than might be hoped, the interpretation of interfering defects is very difficult, the description of reliability and definition of reliability parameters is extremely difficult, different techniques give different results, and it is very difficult to apply the resulting plan.

Next year, Førli expects to present the next report in the Det Norske Veritas NDE series. This will be on guidelines for development of NDE acceptance criteria.

He discussed the issues related to use of information on NDT reliability. In general, reliability data must be presented in a realistic and consistent way, with uniform ways to apply the criteria. All these issues are considered in V-1115-98. The NDE process includes: detection, characterization, evaluation/assessment, and rejection/acceptance. However, if the cost of false detection is very high, then false calls must be described.

He announced that there will be a Second European-American Workshop on NDE Reliability and Validation in Boulder, Colorado in 1999.

2.6 Working Group 2 – Inspection of Offshore Welded Constructions

In the absence of the chairman, A. Raine, O. Førli presented a report and the contribution of this working group, IIW Doc. V-1107-98.

He described the status of the revision of *Information on Practices for Underwater NDE*, IIW 1033-89 (V-908-89). This revision is being driven by new developments in remote inspection and electromagnetic techniques. It has been reviewed by the Subcommission VA, VC, and VE Chairmen. It is being readied for publishing by Woodhead Publishing Limited.

He continued with a summary of (a) the annual report (Document V-1107-98), (b) a report by Alan Raine on changes in inspection for oil and gas installations (Document V-1114-98), and (c) a report on guidelines for NDE reliability (Document V-1115-98).

In summary, some offshore inspection trends are: Less underwater inspection, more topside inspection (for example, corrosion), more extensive use of newer electromagnetic techniques, a substantial reduction in inspection by magnetic particles, and more extensive use of detection of flooding of sealed members to learn of penetration, extended use of remotely operated vehicles, and use of cost- or risk-based inspection.

Førli also discussed advances in the development of acceptance criteria for defects in pipeline girth welds. Automated examination of ultrasonic pipeline girth welds is now much more feasible and is included in the 1996 DNV pipeline rules.

One of the major concerns has been a reduction of interest in this group. Its members are considering their future and what their work program should be. For now, the working program includes review of new problem areas and new techniques such as:

- personnel qualification systems for offshore NDT,
- reliability of offshore NDT techniques and compilation of test trial data,
- comparison of surface inspection techniques,
- offshore/underwater electromagnetic techniques and applications,
- underwater NDT equipment,
- recent developments in automated and remotely operated NDT systems,
- downhole inspection,

- recent developments in local and global structural integrity monitoring techniques for offshore structures, and
- inspection systems, planning and cost optimization, including probabilistic techniques.

2.7 Special Commission V Microseminar on Standards for Quality Management in Welding Shops

Subcommission VB had begun planning this session about a year and a half ago, but the resignation of the Chairman several months ago left the microseminar in jeopardy. Fortunately, D. von Hofe, the Director of the German Welding Society, is a strong supporter of this activity and agreed to finish the planning and to chair the session. At the start of the microseminar, I introduced Dr. von Hofe and invited the attendees to the Subcommission meeting the next morning.

In this half-day seminar, we had 10 presentations, including both presentations on specific aspects of quality management and the status of the use of ISO standards in the major countries. The microseminar was well attended (by about 40 people) and was intended to encourage further participation in Subcommission VB. The papers are being collected for duplication and distribution within the Commission.

Closing comments and observations by the Seminar Chairman included: There is a definite movement to international standards (such as ISO), these standards will likely go head-to-head with the American standards, we should try to make the standards more complete and simpler to implement, and we need to get broader input from all the countries.

2.8 Miscellaneous Commission V Items

In my role as Chairman, I began the meeting with announcements from the Chairman of Commission's Meeting, as well as a report of the Commission's activities and accomplishments for the last year. Some announcements were: The IIW has accepted Belarus and Libya as new members of IIW, the IIW secretariat is developing an Internet site for the working groups to report activities and communicate their working programs and meeting schedules, and the publisher of *Welding in the World* has announced its intention to cancel its contract, so the journal will be published henceforth by the IIW Secretariat. The next Assembly will be in Lisbon, Portugal, July 17 to 22, 1999.

Key action items for this week's meetings were:

- Selecting a Chairman for Subcommission VB (on quality systems) to fill a new vacancy, and
- Selecting a Vice Chairman, who can lead when the Chairman is absent.

In addition, we reviewed our plans to hold a NDE standards workshop at the Spring 1999 American Society for Nondestructive Testing (ASNT) meeting in Orlando, Florida, and to hold our intermediate meetings there on the following day. The workshop will have presentations on the different approaches to NDE standards in different countries, and will discuss how to harmonize NDE standards. The draft of the workshop is described in document V-1110-98. The workshop is presently scheduled for March 24 and the intermediate meetings for March 25. The proposed times for the intermediate meetings are:

- Subcommission VA - March 25, 08:30 to 16:00,
- Subcommission VC - March 25, 08:30 to 12:30,
- Subcommission VE - March 25, 14:00 to 18:00, and
- Subcommission VB - not yet decided.

New documents generated at the meeting were:

- V-1118-98 Minutes of the Meeting - September 14, 1998,
- V-1121-98 Minutes of the Meeting - September 15, 1998, and
- V-1122-98 Minutes of the Meeting - September 16, 1998.

Working group 2 will hold its intermediate meetings independently.

Commission XIII passed a resolution (8) to arrange a joint workshop for 1999 with Commission V on the topic of the capabilities and deficiencies of NDT methods for detecting and sizing flaws which can influence fatigue life. The Commission V contact will be O. Førli.

3. Resolutions of the Annual Assembly 1998

3.1 Resolution 1

The latest digital copying technique developed by BAM was found to produce fully acceptable images (compared to the original film radiographs). Therefore, these images are released for sale by IIW, as Reference Radiograph Set V-1056-95.

3.2 Resolution 2

Subcommission V is forming a new working party "Standardization of NDE Film Digitization," and invites interested parties to contact U. Zscherpel at BAM.

3.3 Resolution 3

Commission V forwards Document V-1111-98, "Application of Imaging Plates in the Radiographic Examination of Welded Joints," for publication in *Welding in the World*.

3.4 Resolution 4

Commission V invites interested persons to a microseminar, "Manual Versus Automated Inspection: Human Factor Influences and Cost Effectiveness," to be held during the 1999 Assembly.

3.5 Resolution 5

Commission V forwards Document V-1112-98, "Non-Destructive Testing - Characterization of Penetrants for Hot Surfaces in Weld Inspection," to ISO through Route 1.

3.6 Resolution 6

Commission V forwards Document V-1113-98, "Penetrants for Hot Surfaces in Welding Inspection: Experimental Work and First Results," for publication in *Welding in the World*.

3.7 Resolution 7

Commission V has reelected Tom Siewert as Chairman for the term 1999 to 2001.

3.8 Resolution 8

Subcommission VE announces a new working party, "Round Robin to Compare Magnetic Memory to other Stress Measurement Techniques." Interested persons should contact G. Dobmann at IZFP.

3.9 Resolution 9

Subcommission VE announces a new working party, "Control of Welds in Polyethylene Using NDE Techniques," which will be chaired by N. Khimchenko of the Russian Delegation.

3.10 Resolution 10

Commission V has elected C. Pepper of the U.S. delegation as the Chairman of Subcommission VB.

3.11 Resolution 11

Commission V has elected G. Dobmann of the German Delegation as the Vice Chairman of Commission V.

4. Work Program of Commission V

4.1 Subcommittee VA – Radiography-Based Weld Inspection Topics

Subcommittee VA will concentrate on the following:

- classification of film systems;
- completion of a standard on radiosopic systems: The Working Party is preparing a three-part standard about the properties and use of radiosopic systems for weld inspection,
- revision of ISO standards: Subcommittee VA supports ISO TC 44 and TC 135 with text proposals for the revision of weld inspection standards, such as the current review of ISO 5817,
- assessment of reliability of radiography: New statistical tools (Receiver Operation Characteristic, ROC) will be applied to the question of a quantitative assessment of radiography,
- evaluation of NDT acceptance criteria in relation to weld quality classes,
- digitization of film, and
- study of new detection equipment, especially imaging plates and new flat detectors.

4.2 Subcommittee VB – Quality Management in Welding Technology

Subcommittee VB will concentrate on the following:

- formulation of a concept for quality management in welding (to clarify the relationships between existing standards and to investigate the need for new standards),
- formulation of a guideline for quality management in welding (to help the user select a quality management program adequate for their organization), and
- collection of information on computer-aided quality control, on-line weld monitoring, fitness for purpose, and acceptance criteria in welding (to define the need for further support in applying these tools).

4.3 Subcommittee VC – Ultrasonically Based Weld Inspection Topics

Subcommittee VC will concentrate on the following:

- revision of the *Handbook on the Examination of Austenitic Welds*,
- elaboration of statements concerning special questions on TOFD and inspection of spot welds,
- revision of the IIW document concerning ultrasonic inspection, especially for the IIW calibration block,
- validation of ultrasonic techniques for weld inspection,
- review of automatic ultrasonic inspection methods (including phased array), and revision of the manual on this topic, and
- acceptance criteria for the ultrasonic inspection of welds.

4.4 Subcommittee VE – Weld Inspection Topics Based on Electrical, Magnetic, and Optical Methods

Subcommittee VE will concentrate on the following:

- low-frequency eddy-current inspection for replacement of magnetic particle inspection of ferritic weldments,
- eddy-current and other electromagnetic inspection of bonded airplane structures, especially for "hidden corrosion,"
- hot inspection of welds by liquid penetrants,
- new activities on thermographic inspection of welds,
- questionnaire on nonmagnetic weldments, and
- organization of a European Project on residual-stress measurements (including Russia, Bulgaria, Romania, Poland, and Western European Countries).

4.5 Subcommittee VF – Weld Defects and Their Significance

No work is planned for 1997/98, apart from necessary follow-up work related to *IIW Guidance on Assessment of the Fitness for Purpose* (SST-1141-89).

4.6 Working Group 2 – Inspection of Offshore Welded Constructions

Working Group 2 will concentrate on the following:

- personnel qualification systems for offshore NDT,
- reliability of offshore NDT techniques and compilation of test trial data,
- comparison of surface inspection techniques,
- offshore/underwater electromagnetic techniques and applications,
- underwater NDT equipment,
- recent developments in automated and remotely operated NDT systems,
- downhole inspection,
- recent developments in local and global structural integrity monitoring techniques for offshore structures, and
- inspection systems, planning and cost optimization, including probabilistic techniques.

Appendix A. Organization, Officials, and Delegates

A.1 Organization of IIW Commission V, Quality Control and Quality Assurance of Welded Products

A.1.1 Subcommissions

- VA Radiography-Based Weld Inspection Topics
 - Working Parties
 - Classification of Film Systems
 - Radioscopic Systems for Weld Inspection
 - Validation of Radiographic Techniques for Weld Inspection
 - Revision of ISO Standards
- VB Quality Management in Welding Technology
- VC Ultrasonically Based Weld Inspection Topics
 - Working Parties
 - Ultrasonic Examination of Austenitic Welds
 - Validation of Ultrasonic Techniques for Weld Inspection
 - Characterization of Ultrasonic Probes for Weld Inspection
- VE Weld Inspection Topics Based on Electrical, Magnetic, and Optical Methods
 - Working Parties
 - Stress Measurement Techniques
 - Liquid Penetrants and Black-light Lamps
 - Eddy-Current Modeling
 - Inspection Techniques for Nonmetallic Joints
- VF Weld Defects and Their Significance

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- 2 Inspection of Offshore Welded Construction

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A.6 Attendance Record – Annual Assembly 1998

Name	Country	Function	14 Sept.	15 Sept.	16 Sept.
Siewert, T.	USA	Commission Chairman/Delegate	×	×	×
McCartney, A.	Canada	Expert	×		
Donggung, P.	China	Observer		×	
Dobmann, G.	Germany	Delegate/Chairman VE	×	×	×
Ewert, U.	Germany	Expert	×	×	
Fischer, A.	Germany	Expert	×		×
von Hofe, D.	Germany	Expert	×	×	×
Wüstenberg, H.	Germany	Expert/Chairman VC	×	×	
Zscherpel, U.	Germany	Expert	×	×	
Peri, F.	Italy	Expert	×	×	×
Kato, M.	Japan	Delegate	×	×	×
van den Berg, R.	The Netherlands	Expert			×
Førli, O.	Norway	Delegate		×	×
Czwornog, B.	Poland	Expert	×		
Schmeleva, I.	Russia	Expert		×	
Zemlianski, V.	Russia	Expert	×		×
Rihar, G.	Slovenia	Delegate	×	×	×
Johansson, C.	Sweden	Delegate	×	×	×
Wiesner, C.	United Kingdom	Expert	×		×
Pepper, C.	United States	Expert	×	×	×
Verma, K.	United States	Expert	×	×	×
Sedmak, S.	Yugoslavia	Delegate	×		

A.6.1 Attendance statistics

	16 July	17 July	18 July	Any day
Participants:	18	15	14	22
Delegates:	8	6	6	7
Experts:	10	8	8	14
Observers:	0	1	0	1
Countries present	11	9	10	14

A.7 Recent Subcommittee and Working Group Meetings

Subcommission VA	20 January 1997	Paris, France
	19 January 1998	Paris, France
Subcommission VB	17 March 1995	Basel, Switzerland
	23 January 1997	Paris, France
Subcommission VC	21 January 1997	Paris, France
	20 January 1998	Paris, France
Subcommission VE	22 January 1997	Paris, France
	21 January 1998	Paris, France
Subcommission VF	No meetings	
Working Group 2	8 September 1995	Aberdeen, UK
	numerous contacts by mail and fax	

A.8 Tentative Schedule for Commission V Meetings 1998/99

We plan to meet in conjunction with the spring meeting of ASNT, in Orlando, Florida. The proposed dates for these meetings are:

- Subcommission VA - March 25, 08:30 to 16:00,
- Subcommission VC - March 25, 08:30 to 12:30,
- Subcommission VE - March 25, 14:00 to 18:00, and
- Subcommission VB - not yet decided.

Working Group 2 will hold their intermediate meetings as needed, probably in the U.K. or northern Europe.

The 1999 Annual Assembly will be in Portugal, with a Commission V Microseminar on influence of automation on acceptance criteria.

The 2000 Annual Assembly will be in Italy.

Appendix B. Recent Commission V Publications and Documents

B.1 Handbooks and Booklets

- V-1056-95 *Reference Radiographs for Assessment of Welding Imperfections According to ISO 5817* (IIS/IIW 1290-95)

B.2 *Welding in the World* Articles

1996

- V-1067-96 "Lifetime Extension – The Contribution of Low- and Multi-Frequency Eddy Current Techniques to Assure the Integrity of the Cladding in Nuclear Power Plant Vessels," G. Dobmann, R. Becker, M. Disque, Ch. Rodner, and N. Both, *Welding in the World*, vol. 39, no. 5, 1997. (IIS/IIW 1328-96)
- V-1068-96 "Online Closed Loop Control of Spot Welding – An Example of Process Integrated Non-Destructive Testing," E. Waschkies, *Welding in the World*, vol. 39, no. 6, 1997. (IIS/IIW 1329-96)
- V-1069-96 "Predicting the Performance of Eddy Current Probes," J. Moulder, *Welding in the World*, vol. 39, no. 3, 1997. (IIS/IIW 1330-97)

1997

- V-1096-07 "Screening of Weld Quality Using the Magnetic Memory Effect," A. Doubov, *Welding in the World*, vol. 41, no. 3, 1998.
- V-1097-97 "Information on Practices for Underwater Nondestructive Examination," for publication by IIW as a Class B document, to replace the present IIW/IIS 1033.
- V-1098-97 "On-Line Weld Monitoring – CAQ in Welding – State of Technology and Practical Experiences in Germany," *Welding in the World*, vol. 41, no. 1, 1998.

B.3 Commission V Documents 1997/98

Number	Title/Document Description
V-1082-97	Subcommission VB Annual Report - 1997
V-1085-97	Working Group 2 Annual Report - 1997
V-1093-97	Minutes of the Annual Assembly Meeting - 16 July 1997
V-1094-97	Minutes of the Annual Assembly Meeting - 17 July 1997
V-1095-97	Minutes of the Annual Assembly Meeting - 18 July 1997
V-1096-97	"Screening of Weld Quality Using the Magnetic Memory Effect," A. Doubov
V-1097-97	"Information on Practices for Underwater Non-Destructive Examination" (replaces IIW/IIS 1033-89)
V-1098-97	"On-Line Weld Monitoring/CAQ in Welding: State of Technology, Practical Experiences in Germany," E. Oster
V-1099-97	"Concept for Quality Management," (from S/C VB)
V-1100-98	Commission V Annual Report - 1997/98
V-1101-98	Agenda for 1998 Annual Assembly - Hamburg, Germany
V-1102-98	Commission V Documents - 1997/98
V-1103-98	Subcommission VA Annual Report
V-1104-98	Subcommission VC Annual Report
V-1105-98	Subcommission VE Intermediate Report - 1/98
V-1106-98	Subcommission VE Annual Report
V-1107-98	Working Group 2 Annual Report
V-1108-98	VB Microseminar "Standards for Quality Management in Welding Shops," scheduled for the afternoon of 15 September 1998
V-1109-98	Preliminary Agenda for "International Workshop on NDE Standards," to be held March 9 or 10, 1999, the day before the 1999 Commission V intermediate meetings at the spring ASNT meeting in Orlando Florida.

- V-1110-98 "Method of Metal Magnetic Memory in the Estimation of Stress-Strain State of Equipment and Structures as compared to the Known Methods of Stress and Strain Testing," A. Doubov
- V-1111-98 "Application of Imaging Plates in the Radiographic Examination of Welded Joints," G. Rihar, J. Rant, J. Stade, and M. Kaling
- V-1112-98 "Non-Destructive Testing - Characterization of Penetrants for Hot Surfaces in Weld Inspection," Draft of Proposed ISO Standard
- V-1113-98 "Penetrants for Hot Surfaces in Welding Inspection: Experimental Work and First Results," G. Calcagno and R. Marmigi
- V-1114-98 "The Changing Face of Inspection of Oil and Gas Offshore Installations," G. Raine
- V-1115-98 "Guidelines for NDE Reliability Determination and Description," Olaf Førli
- V-1116-98 "Investigation of IIW Calibration Block 1," H. Wüstenberg
- V-1117-98 "Minutes of the Intermediate Meeting of IIW Subcommittee VC - Institute de Soudure, Paris 20 January 1998," H. Wüstenberg

B.4 Documents Recommended for Publication

1997 Assembly

Document V-1096-07, "Screening of Weld Quality Using the Magnetic Memory Effect," by A. Doubov, *Welding in the World*, vol. 41, no. 3, 1998.

Document V-1097-97, "Information on Practices for Underwater Nondestructive Examination," for publication by IIW as a Class B document, to replace the present IIW/IIS 1033.

Document V-1098-97, "On-line Weld Monitoring - CAQ in Welding - State of Technology and Practical Experiences in Germany," *Welding in the World*, vol. 41, no. 1, 1998.

1998 Assembly

Document V-1111-98, "Application of Imaging Plates in the Radiographic Examination of Welded Joints," for publication in *Welding in the World*.

Document V-1112-98, "Non-Destructive Testing - Characterization of Penetrants for Hot Surfaces in Weld Inspection," to ISO through Route 1.

Document V-1113-98, "Penetrants for Hot Surfaces in Welding Inspection: Experimental Work and First Results," for publication in *Welding in the World*.

